■ Interagency Ecological Program for the San Francisco Estuary ■

IEP NEWSLETTER

VOLUME 23, NUMBER 3, Summer/Fall 2010

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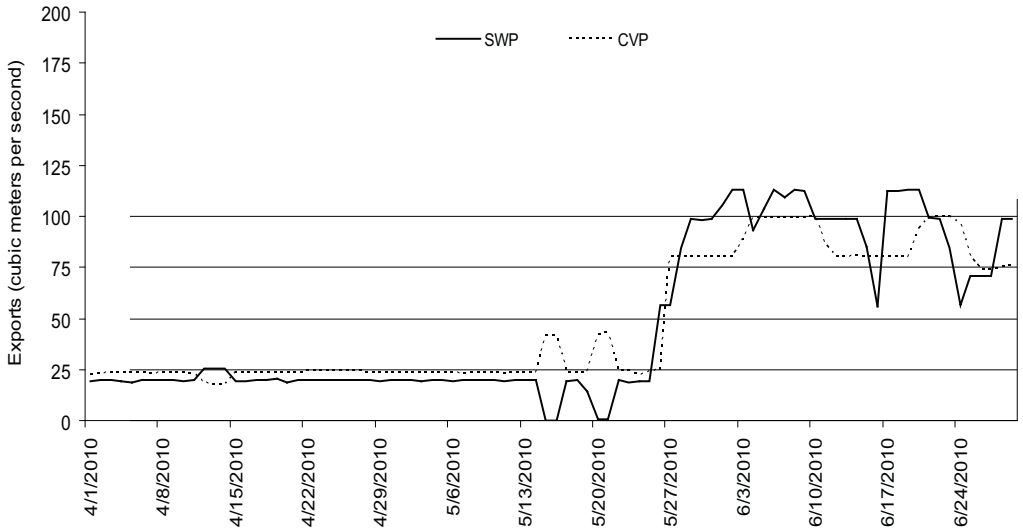

Figure 2 April through June 2010 State water Project and Central Valley Project Exports

2010 Smelt Larva Survey

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The California Department of Fish and Game (DFG) successfully completed the second field season of the Smelt Larva Survey (SLS) in late March. Initiated in 2009, the SLS monitors the distribution and relative abundance of larval longfin smelt (*Spirinchus thaleichthys*) in near real-time. These data are used to assess the vulnerability of larva to entrainment at south Delta water-export facilities. Longfin smelt are the focus of this program because of their recent listing as threatened under the California Endangered Species Act (CESA).

From January 4 until March 24, 2010, we conducted 6 bi-weekly Delta-wide surveys consisting of a single sample (one 10-minute stepped oblique tow) taken at 35 locations (Figure 1). The net (length = 3.35 m, mouth area = 0.37 m^2, mesh size = 505 µm) is mounted to a rigid steel frame. Skis are attached to the frame to prevent the frame and net from digging into the substrate during deployment. Once a tow is complete, all larval fish are preserved in 10% buffered formalin and returned to our Stockton laboratory for positive identification. A full description of methods and protocol is available through this author.

A total of 31,385 fish representing 16 species (Table 1) were collected. Longfin smelt, prickly sculpin (*Cottus asper*), and Pacific herring (*Clupea pallasi*) were the most-abundant and most-widely distributed fishes encountered. Yellowfin gobies (*Acanthogobius flavimanus*) was fourth most abundant and the remaining 12 species comprised less than 5% of total catch.

Longfin smelt showed broad distributions throughout each survey and were collected in 88.4% (183 of 207) of all the samples taken (Figure 2). Samples with no longfin smelt were located in the central or south Delta. Highest densities of longfin smelt occurred at or downstream of the Sacramento-San Joaquin confluence in every survey, and average lengths (Figure 3) consistently show that older (larger) larvae occur there more than upstream. Coincident to a 3°C rise in average water temperature from the previous survey (Figure 4) and an increase in average lengths Delta-wide, total catch peaked in Survey 4 (Figure 5) with 4078 longfin larvae collected from 31 of the 35 stations sampled.

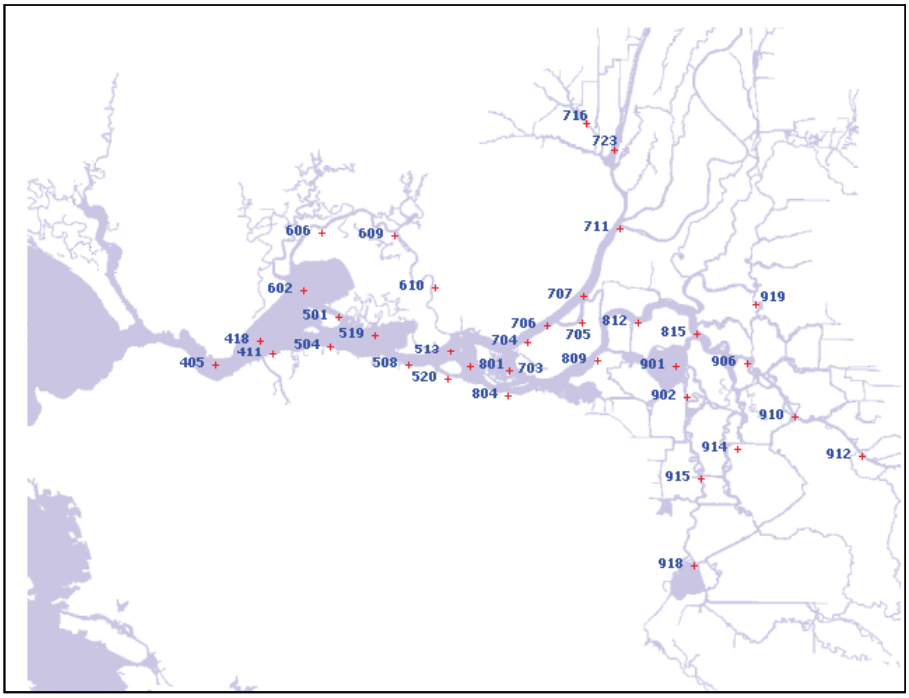

Figure 1 Station locations sampled by the Department of Fish and Game's Smelt Larva Survey

Table 1 Total species catch from the Department of Fish and Game's Smelt Larva Survey, 2010

2010 Smelt Larva Survey: Species Catch		
Common Name	*n*	*% of Catch*
Longfin Smelt	14241	45.38%
Prickly Sculpin	9531	30.37%
Pacific Herring	6289	20.04%
Yellowfin Goby	1147	3.65%
Arrow Goby	107	0.34%
Northern Anchovy	26	0.08%
Three Spine Stickle-back	12	0.04%
Pacific Staghorn Scul-pin	8	0.03%
Delta Smelt	6	0.02%
Bigscale Logperch	6	0.02%
Jacksmelt	3	0.01%
Chinook Salmon	3	0.01%
Shokihaze Goby	2	0.01%
Shimofuri Goby	2	0.01%
White Catfish	1	0.003%
Cyprinids (Unid)	1	0.003%

The SLS proved to be a useful tool for resource management. We provided weekly catch reports (distribution and abundance) to the Smelt Working Group (SWG) for its use in assessing entrainment risk to delta smelt and longfin smelt larvae. Our data, coupled with that of other agencies, allowed the SWG to make informed recommendations to the U.S. Fish and Wildlife Service regarding larval delta smelt, and to DFG's Director regarding the impact of water export operations on larval longfin smelt. Such recommendations to DFG's Director are required by Section 5.2 of the *California Endangered Species Act Incidental Take Permit No. 2081-2009-001-03*, which states: "To protect larval and juvenile longfin smelt during the January through June period, the SWG or DFG SWG personnel shall provide OMR (Old and Middle River) flow advice to the WOMT (Water Operations Management Team) and to the Director weekly." Further, "When a single Smelt Larva Survey (SLS) or 20 mm Survey (20 mm) sampling period results in: 1) longfin smelt larvae or juveniles found in 8 or more of the 12 SLS or 20 mm stations in the south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919) or, 2) catch per tow exceeds 15 longfin smelt larvae or juveniles in 4 or more of the 12 survey stations listed above, OMR flow advice shall be warranted" (available at http://www.dfg.ca.gov/delta/data/longfinsmelt/documents/ITP-Longfin-1a.pdf).

The next bi-weekly SLS is scheduled to begin in early January 2011 and conclude in March or April (depending on water year). All data is available through our FTP site (ftp://ftp.delta.dfg.ca.gov/Delta%20Smelt/), and fish distribution maps are available on our project web-page (http://www.dfg.ca.gov/delta/projects.asp?ProjectID=SLS).

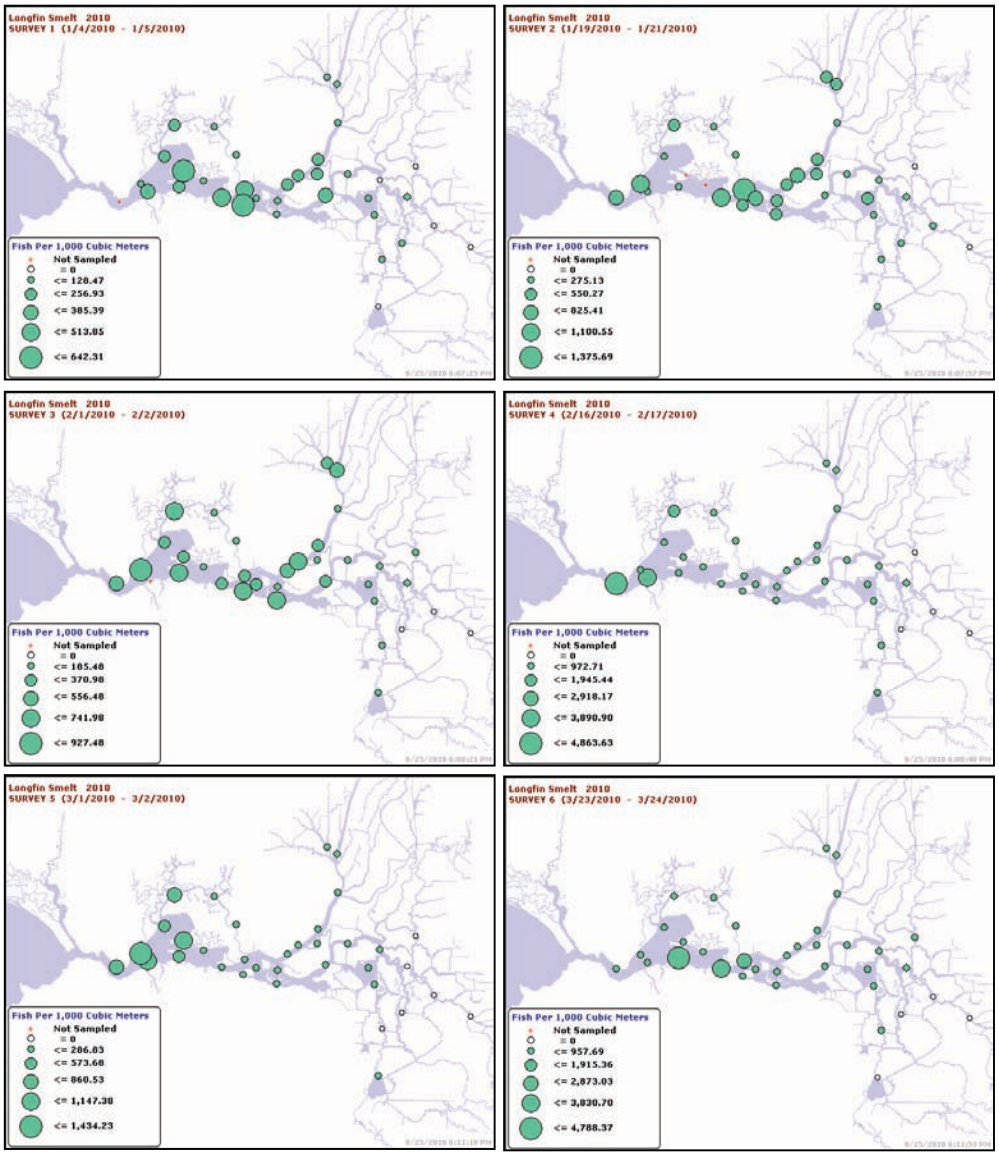

Figure 2 Geographical distribution and catch per unit effort of longfin smelt collected by the Department of Fish and Game's Smelt Larva Survey, 2010. Bubble plots are taken from the Smelt Larva Survey web-page (http://www.dfg.ca.gov/delta/projects.asp?ProjectID=SLS).

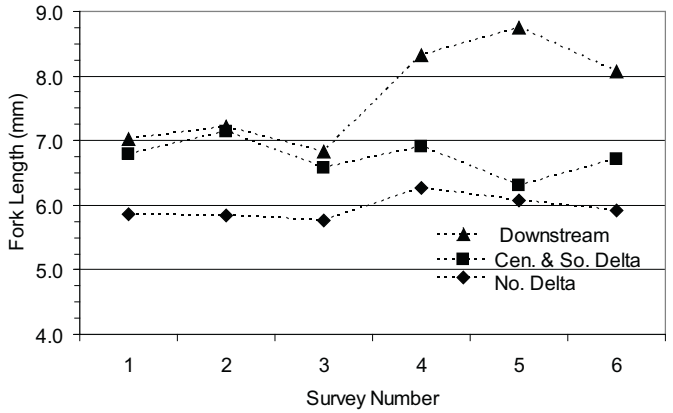

Figure 3 Average fork lengths of longfin smelt collected in DFG's Smelt Larva Survey, 2010. Fork lengths are grouped by survey number for 3 distinct geographic regions. Downstream refers to fish collected below Decker Island on the Sacramento River and below Jersey Point on the San Joaquin River. Cen. & So. Delta refers to stations within the Central and South Delta. No. Delta refers to stations above Decker Island on the Sacramento River.

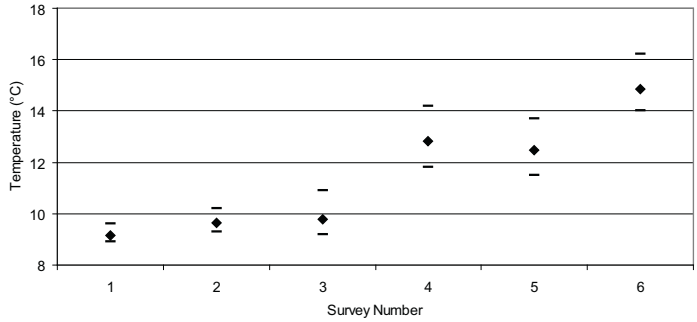

Figure 4 High, low, and average temperatures for each survey of DFG's Smelt Larva Survey, 2010.

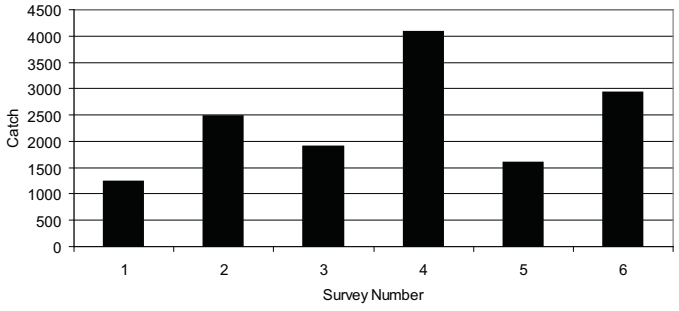

Figure 5 Summed catch (by survey) of longfin smelt collected by DFG's Smelt Larva Survey, 2010.

Disease Occurance in Adult Delta Smelt Captured in Sacramento River Kodiak Trawl, 2010

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Abstract

Delta smelt abundance has declined drastically and the species was listed as threatened in 1993. The role of disease in this decline is largely unknown. One hundred and five adult smelt, collected from the lower Sacramento River between January and May 2010, were surveyed for infectious agents, blood leukocyte profile, and gill Na-K-ATPase activity. Few tissue changes or significant parasitic infections were observed in histological specimens and there was a low incidence of bacterial isolations. Asymptomatic *Mycobacterium sp.* infection was detected in 54% of the samples by PCR; however, this bacterial group was not isolated in culture. Gill Na-K-ATPase activity was lower in the January sample than subsequent month collections. The number of blood granulocytes increased between March and May. Disease did not appear to be an overt influence on the surveyed population in the spring of 2010.

Introduction

The delta smelt (*Hypomesus transpacificus*) was listed as threatened under the Endangered Species Act in 1993 and is endemic to the upper San Francisco Bay Estuary (Moyle et al. 1992). In the last decade, a clade of pelagic organisms in the delta has declined in abundance (Feyrer et al. 2007). Potential factors associated with these declines in delta smelt include reduction in freshwater flows, entrainment losses at diversions and power plants, inadequate food base and competition for food from exotic species, environmental contaminants, and predation by exotic fishes. Only limited work has been reported on smelt disease (Antonio et al. 2000, Teh 2007). Our objective was to determine the presence of infectious pathogens (virus, bacteria, or parasites), tissue abnormalities (gill, liver, intestinal tract), peripheral blood cell profile, and gill Na-K-ATPase activity in adult smelt captured in the lower Sacramento River between January and May 2010.